WHAT IS CLAIMED IS:

1. A magnetic memory device comprising:

a first conductive layer;

a second conductive layer formed above the first conductive layer and arranged substantially perpendicular to the first conductive layer;

a plurality of magneto-resistance effect elements formed between the first and second conductive layers, arranged in the lengthwise direction of the first conductive layer and containing free layers whose spin directions are controlled to be reversed by a resultant magnetic field caused by the first and second conductive layers; and

a magnetic layer inserted between the first conductive layer and the magneto-resistance effect element and causing magnetic interaction with respect to the free layers of the magneto-resistance effect element.

2. The magnetic memory device according to claim 1, wherein each of the magneto-resistance effect elements includes a free layer disposed on the magnetic layer, a tunnel barrier layer disposed on the free layer, a pin layer disposed on the tunnel barrier layer and a fixing layer which is disposed on the pin layer and fixes the spin direction of the spin layer.

3. The magnetic memory device according to claim 2, wherein the fixing layer includes at least

an anti-ferromagnetic body.

4. The magnetic memory device according to claim 1, wherein the magnetic layer includes a soft magnetic body.

5. The magnetic memory device according to claim 4, wherein the soft magnetic body includes a soft magnetic alloy containing at least Ni.

6. The magnetic memory device according to claim 1, wherein the magneto-resistance effect elements are arranged with the lengthwise direction thereof being substantially perpendicular to the lengthwise direction of the first conductive layer, the spin of the free layer is set in the lengthwise direction of the magneto-resistance effect element, the spin of the magnetic layer is set in the lengthwise direction of the magnetic layer, and magnetic interaction which causes the spin of the free layer to be set in the short-length direction of the magneto-resistance effect element and causes the spin of the magnetic layer to be set in the short-length direction of the magnetic layer occurs while a programming current is being passed through the first conductive layer.

7. The magnetic memory device according to claim 1, wherein the magneto-resistance effect elements are arranged with the lengthwise direction thereof being substantially in the same direction as the lengthwise direction of the first conductive layer,

the spin of the free layer is set in the lengthwise direction of the magneto-resistance effect element, the spin of the magnetic layer is set in the lengthwise direction of the magnetic layer, and magnetic interaction which causes the spin of the free layer to be set in the short-length direction of the magneto-resistance effect element and causes the spin of the magnetic layer to be set in the short-length direction of the magnetic layer occurs while a programming current is being passed through the first conductive layer.

8. The magnetic memory device according to claim 6, wherein the magnetic layer has magnetic property which is substantially uniform over the entire portion thereof.

9. The magnetic memory device according to claim 7, wherein the magnetic layer has magnetic property which is substantially uniform over the entire portion thereof.

10. The magnetic memory device according to claim 6, wherein the magnetic layer has magnetic resistive portions each of which has larger resistance than the internal portion of each of the magneto-resistance effect elements and is formed between preset adjacent two of the magneto-resistance effect elements.

11. The magnetic memory device according to claim 10, wherein each of the magnetic resistive

portions includes at least one gap formed between the magneto-resistance effect elements of the magnetic layer.

12. The magnetic memory device according to claim 10, wherein each of the magnetic resistive portions includes at least one gap formed for every preset number of magneto-resistance effect elements of the magnetic layer.

13. The magnetic memory device according to claim 10, wherein each of the magnetic resistive portions includes at least one cut-away portion formed between preset adjacent two of the magneto-resistance effect elements in at least one of two end portions of the magnetic layer extending in the lengthwise direction thereof.

14. The magnetic memory device according to claim 10, wherein each of the magnetic resistive portions includes at least one projection formed between preset adjacent two of the magneto-resistance effect elements in at least one of two end portions of the magnetic layer extending in the lengthwise direction thereof.

15. The magnetic memory device according to claim 1, wherein the magnetic layer is formed not only on the surface of the first conductive layer which faces the free layer but also on both side surfaces of the first conductive layer.

16. The magnetic memory device according to claim 1, wherein the magnetic layer is formed to cover the entire surface of the first conductive layer.

17. A magnetic memory device comprising:

a first conductive layer;

a second conductive layer formed above the first conductive layer and arranged substantially perpendicular to the first conductive layer; and

a plurality of magneto-resistance effect elements formed between the first and second conductive layers, arranged in the lengthwise direction of the first conductive layer and containing free layers whose spin directions are controlled to be reversed by a resultant magnetic field caused by the first and second conductive layers;

wherein the first conductive layer is formed of a soft magnetic body which causes magnetic interaction with respect to the free layers of the magneto-resistance effect elements.

18. The magnetic memory device according to claim 1, further comprising an intermediate layer inserted between the magneto-resistance effect elements and the magnetic layer, the magnetic layer and free layers causing magnetic interaction to occur via the intermediate layer.

19. The magnetic memory device according to claim 18, wherein the intermediate layer has

substantially the same area as the magnetic layer.

20. The magnetic memory device according to claim 18, wherein the intermediate layer contains a non-magnetic conductive body.

21. The magnetic memory device according to claim 18, wherein the intermediate layer contains at least one of Cu, Ru, Au, Cr.

22. The magnetic memory device according to claim 1, further comprising a yoke portion which covers at least one of the upper surface and both side surfaces of the second conductive layer.

23. The magnetic memory device according to claim 22, wherein the yoke portion is formed of the same material as the magnetic layer.

24. The magnetic memory device according to claim 22, wherein the yoke portion contains a soft magnetic body.

25. The magnetic memory device according to claim 22, wherein the soft magnetic body contains a soft magnetic alloy containing at least Ni.

26. The magnetic memory device according to claim 1, wherein an easy axis of the free layer is set substantially perpendicular to an easy axis of the magnetic layer before passing a programming current through the first conductive layer and a hard axis of the free layer is set substantially perpendicular to a hard axis of the magnetic layer after passing the

programming current through the first conductive layer.

27. The magnetic memory device according to claim 1, wherein an easy axis of the free layer is set in a direction substantially opposite to an easy axis of the magnetic layer before passing a programming current through the first conductive layer and a hard axis of the free layer is set in a direction substantially opposite to a hard axis of the magnetic layer after passing the programming current through the first conductive layer.